AOIT Computer Systems

Lesson 8

Overview of Linux and Mac Operating Systems

Student Resources

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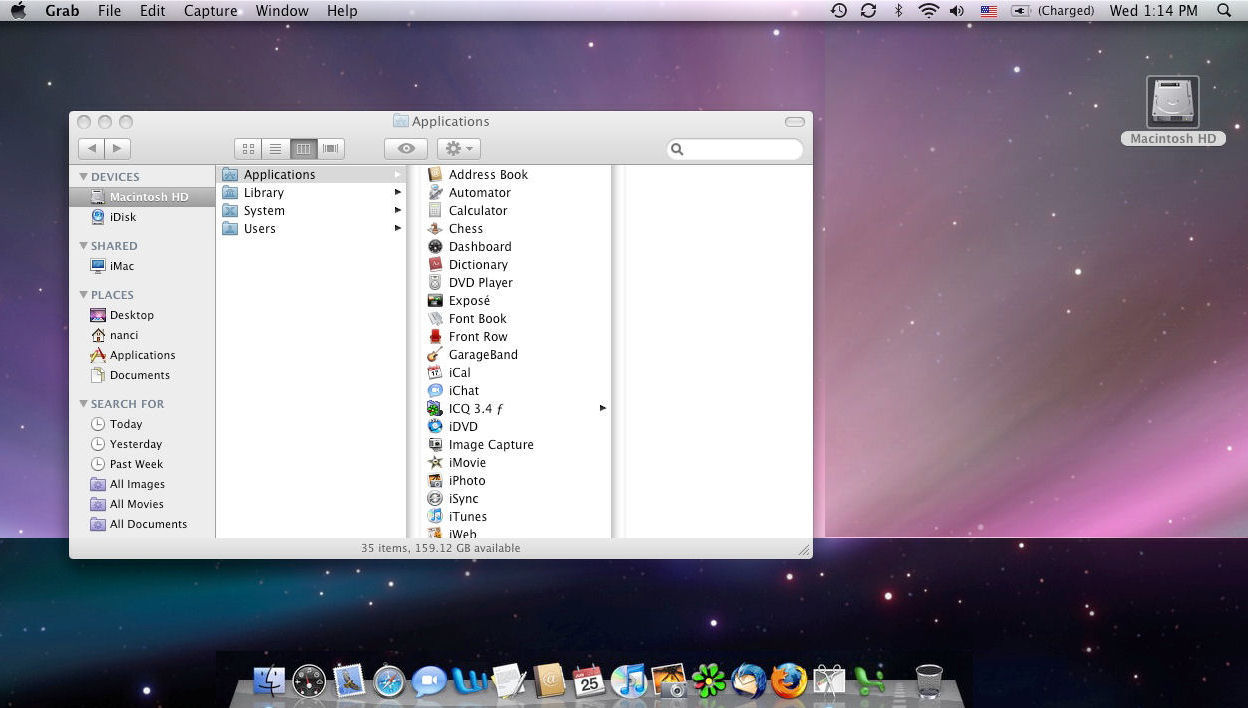
Student Resource 8.1

Worksheet: OS Comparison

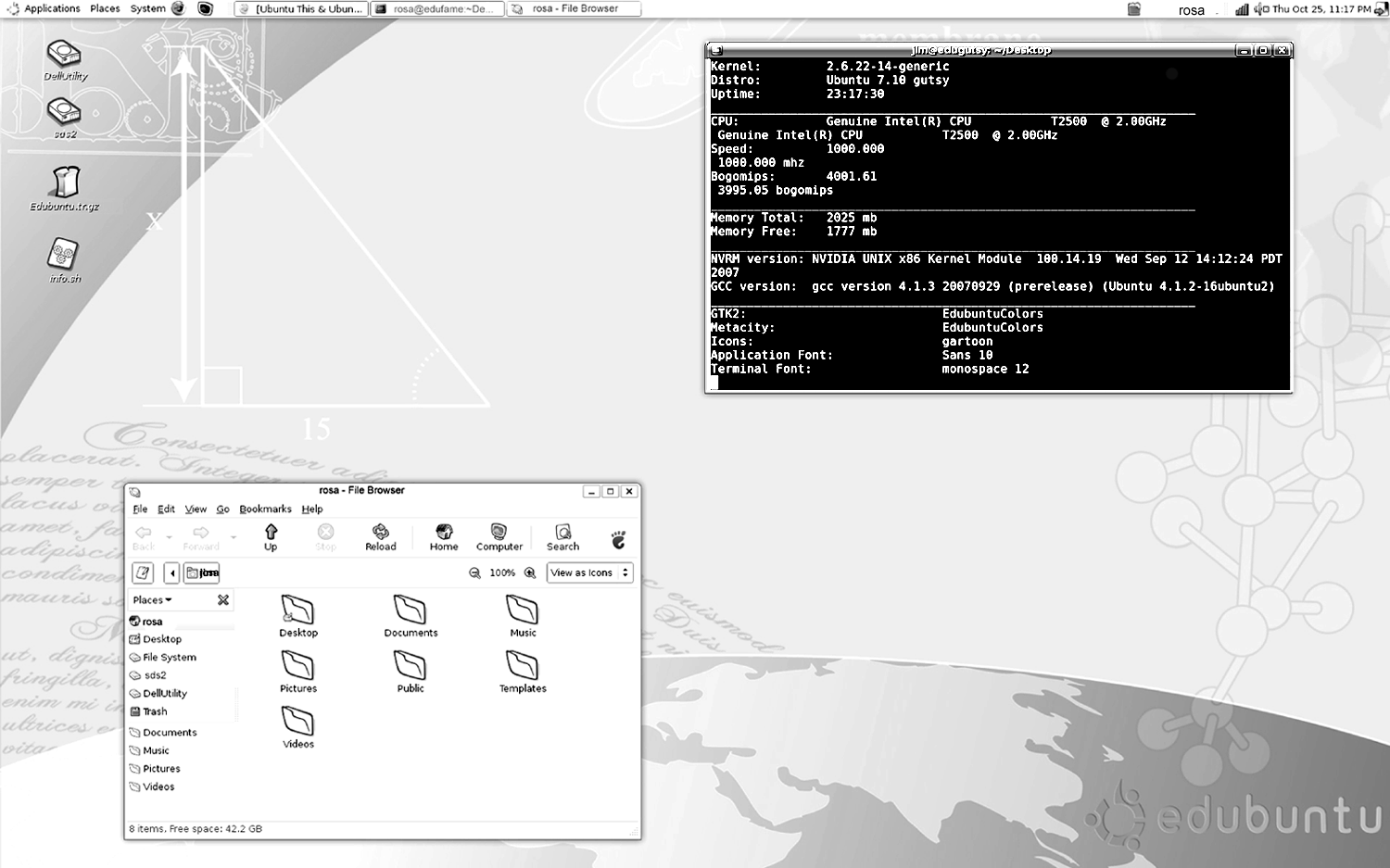
Student Names: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Directions: Based on what you see in the images, list at least five similarities between Windows, Mac, and Linux. Then, use the table below to note what is different about the three operating systems. Examples are provided.

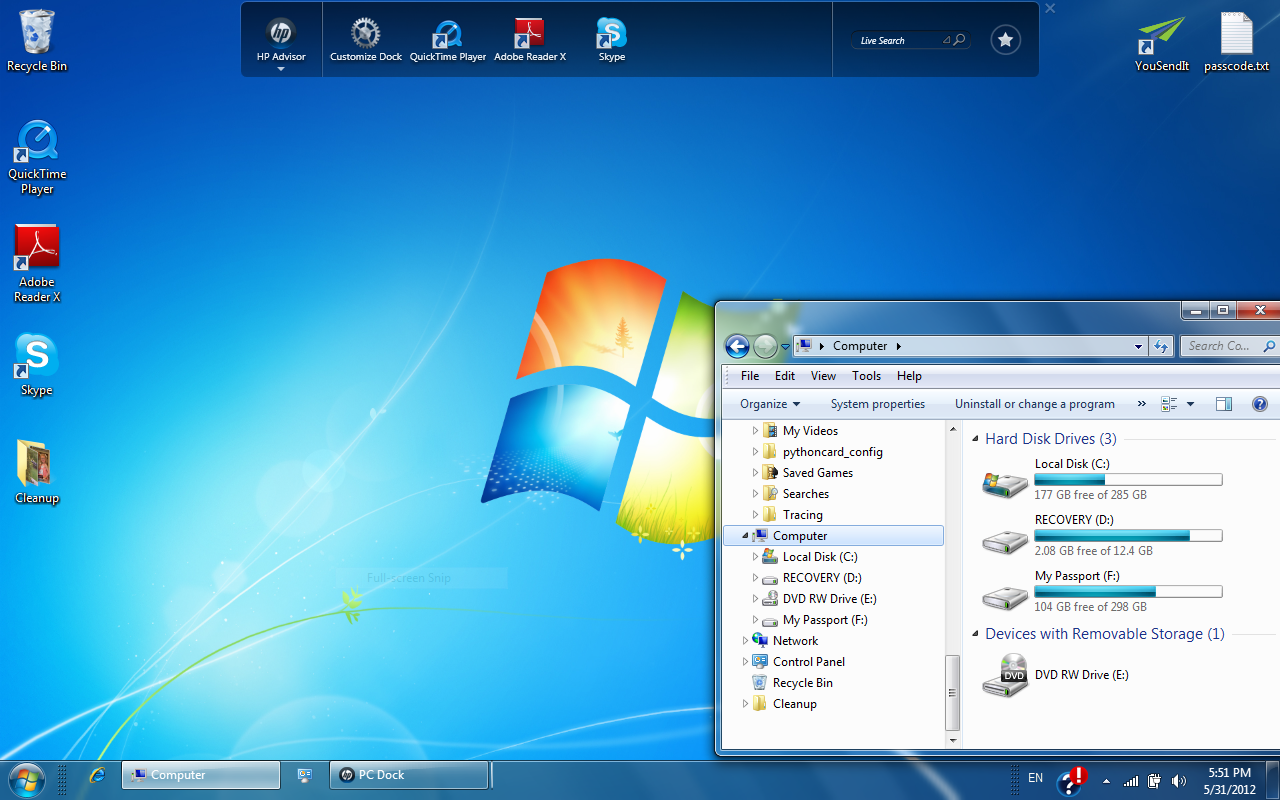
|  |  |  |
| --- | --- | --- |
| Similarities between Windows, Mac, and Edubuntu (Linux) | | |
| All have pictures on the desktops. | | |
| 1. | | |
| 2. | | |
| 3. | | |
| 4. | | |
| 5. | | |
| Differences between Windows, Mac, and Edubuntu (Linux) | | |
| Windows | Mac | Edubuntu (Linux) |
| Clock is on the lower-right toolbar. | Clock is on the upper-right toolbar. | Clock is on the upper-right toolbar. |
|  |  |  |
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|  |  |  |
|  |  |  |



**Mac OS X Desktop**



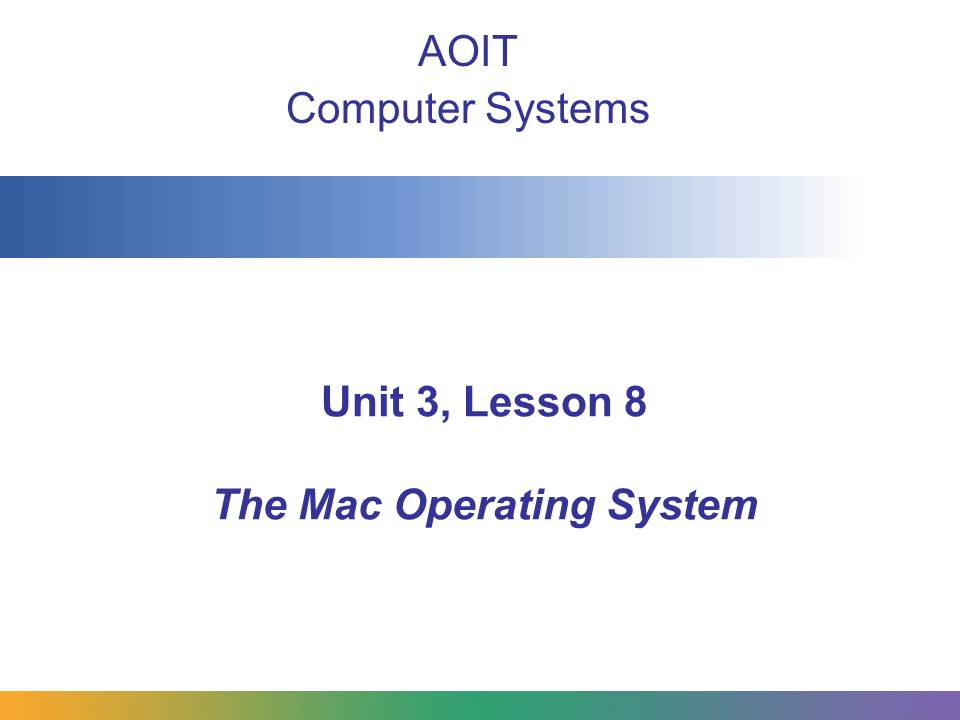
**Edubuntu (Linux) Desktop**



**Windows 7 Desktop**

Student Resource 8.2

Reading: The Mac Operating System



This presentation explains how the Mac operating system is similar to Windows in many ways and points out the features that make these computers “distinctly Mac.”

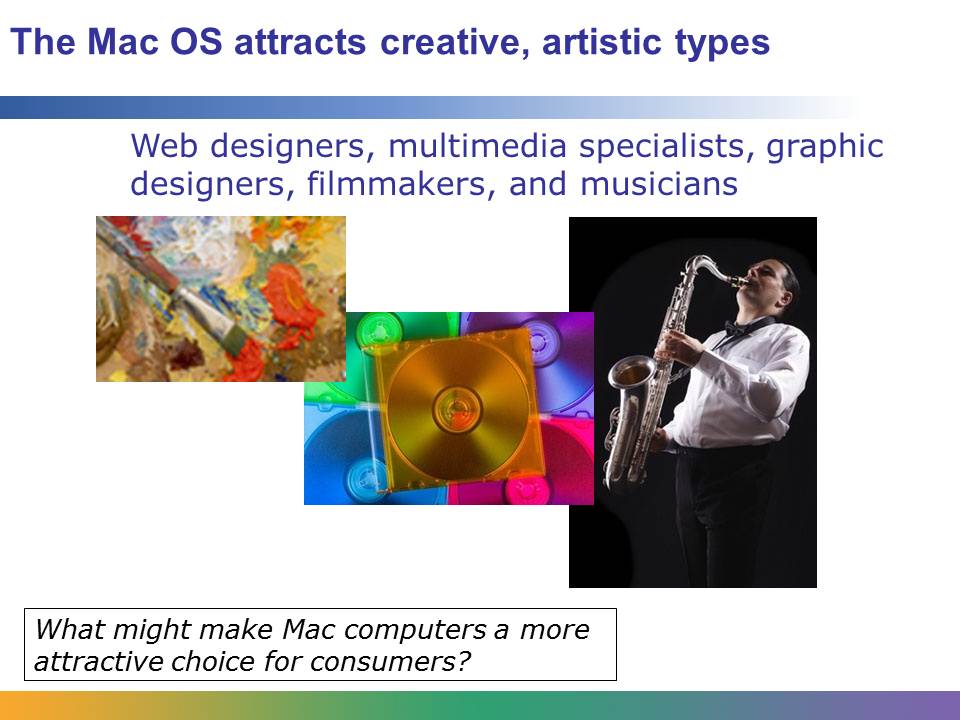


It was Xerox’s Palo Alto Research Center (PARC) that first developed the graphical user interface (GUI) and mouse.

The first successful commercial GUI product was the Apple Macintosh computer, which was heavily inspired by PARC’s work. Xerox was allowed to buy pre-IPO stock from Apple, in exchange for engineer visits and an understanding that Apple would create a GUI product.

Apple Inc. introduced the first Macintosh computer (the Macintosh 128k) in 1984, which (arguably) became a major influence in the development of graphical interfaces elsewhere.

The Mac OS went through a huge overhaul in 1999 when it evolved from a totally graphical system that lacked a command-line interface (CLI) to a Unix-based OS that allowed a CLI, better memory management, and increased multitasking capabilities. The new Mac OS is called Mac OS X (“ten”), and its versions are named after big cats. The most recent release of Mac OS X is 10.7, “Lion.”

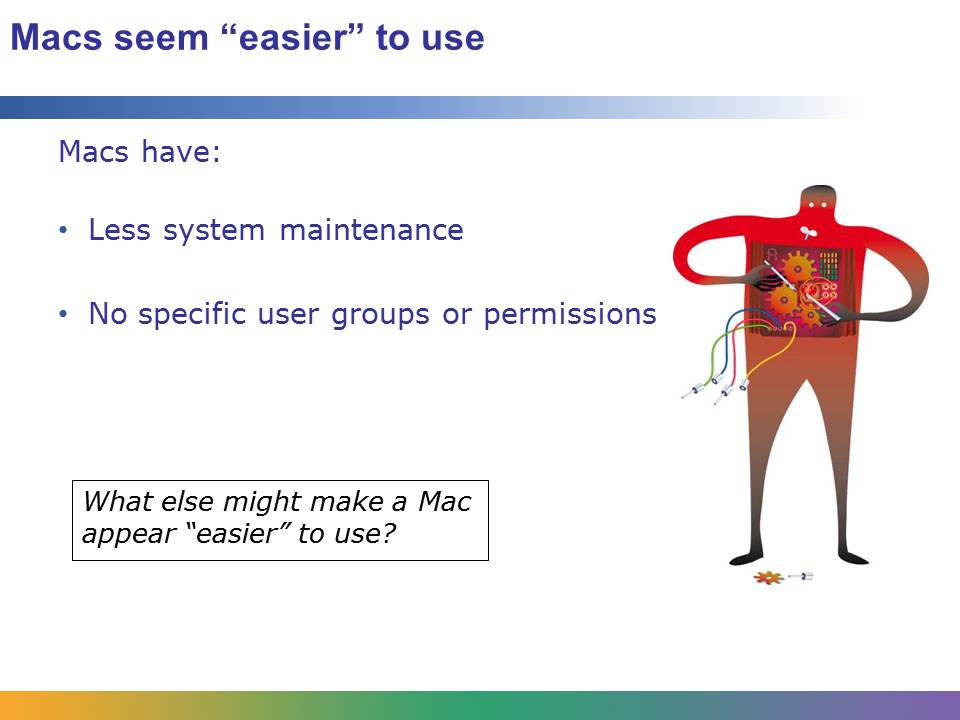


In 2006, Mac was estimated to have 4.6% of the desktop/laptop market in the United States. In 2007, that percentage had risen to 10–14%. Many of these users create things other than words with their Macs.

From its creation, the intended role of the Mac OS was to support nontechnical end users with an interface that involved very little complexity. This has made developers of Mac software very, very good at designing simple interfaces.

Macs also support most plug-and-play peripherals, meaning there are rarely any problems plugging in a camera, a printer, a piano keyboard, and so on, and expecting it to play. The drivers the computer usually needs are all pre-installed.

These user-friendly attributes make a Mac seem easier to use than Windows or Linux to a lot of people.

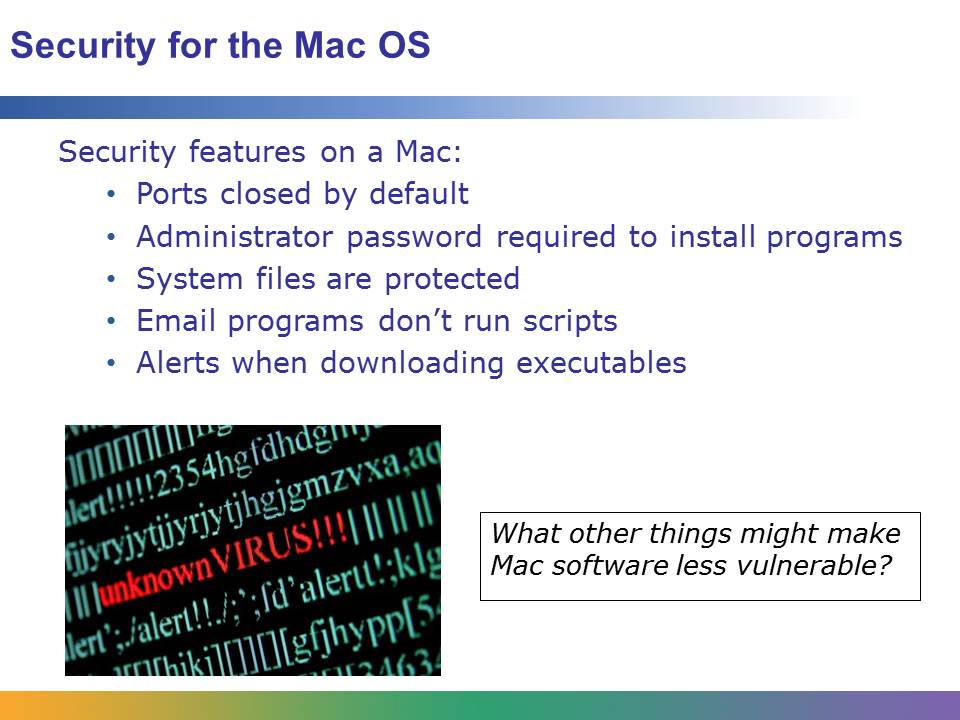


Macs don’t have many hardware system utilities. Because of the way the computer stores data, it requires no defragmenting or disk cleaning like a Windows or Linux machine does.

A Mac is designed primarily to limit the amount of work a user has to do “under the hood” of the computer, so there are no weekly or monthly maintenance jobs to be done. It is still important to use automatic updates to update your operating system or software, but Apple alerts you when these are available so you won’t miss any.

There are troubleshooting capabilities built into the operating system. For example, you can use the “disk utility” feature to fix a problem with a drive or the “repair file permissions” function that helps fix permission problems that may have been introduced when you copy files from one drive to another.

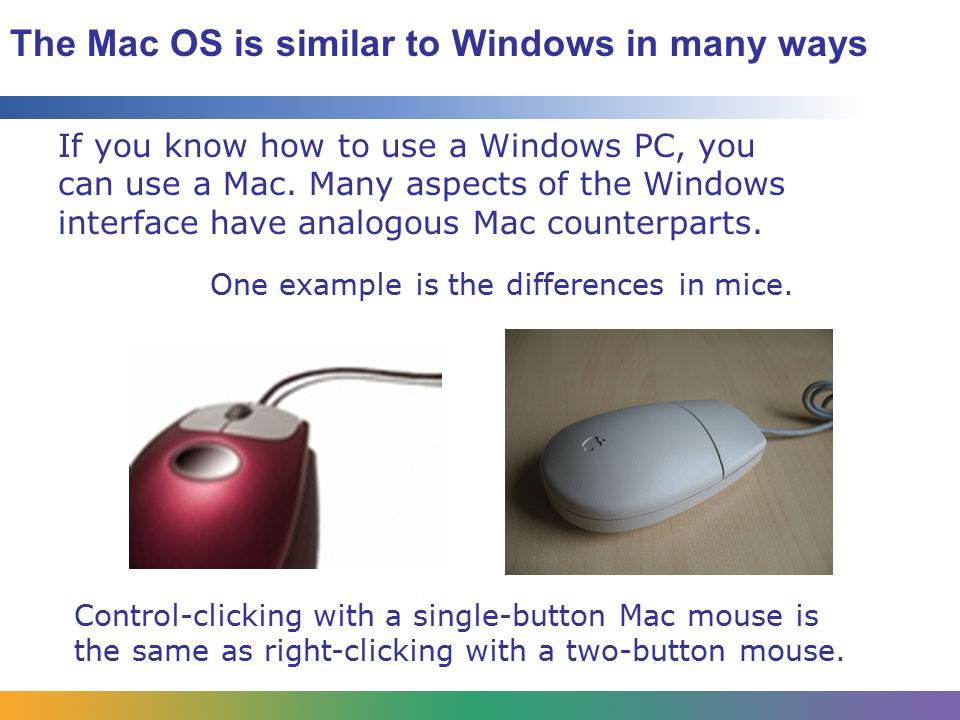
User support is available by way of hobbyist user groups across the world, and of course the main source of user support is from its maker, Apple Inc. (http://www.apple.com/support/). Finally, as “brick and mortar” Apple Stores continue to gain popularity nationwide, users can also get face-to-face support at one of the many store locations. You can even make an appointment at one of these stores with a “Mac genius” who can teach you how to use new tools and features you didn’t previously know.



In the Mac world, it is usually assumed there is only one user per computer, so there are no per-user privilege groups to alter permission levels. There are commercial products from companies like Symantec and McAfee that protect Macs against malware in the same way Windows users are protected. The Mac OS X also contains a firewall and encrypted file system that help protect a user’s data.

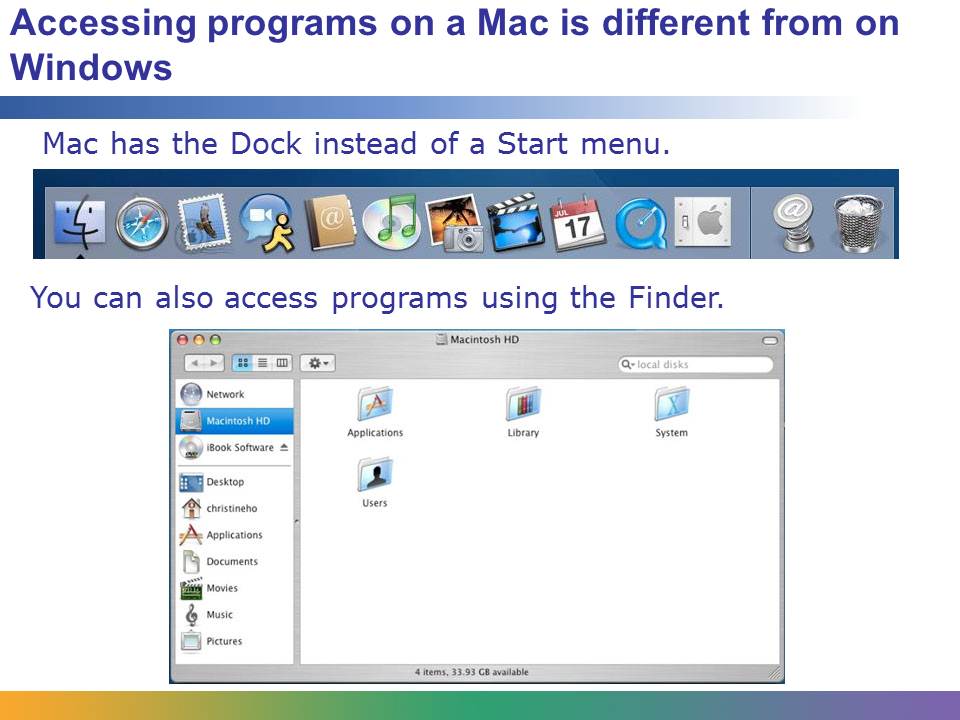
On Macs, ports (channels to the Internet) are locked by default, whereas some versions of Windows have certain ports open by default. On Macs, an administrator must log in with his password every time a program is installed. Even with a password, files that are part of the Mac operating system cannot be modified. In addition, Mac email programs don’t run scripts on incoming emails. Before an executable file is downloaded from the Internet, a dialog box pops up and asks you to confirm that you intended to download the file. Although Mac adopted these security strategies early on, many of these features are also included in the more recent versions of Windows.

It is important to remember that in spite of all of these security protections, Macs do need anti-virus/spyware protection. They definitely have vulnerabilities that are exploited by hackers.

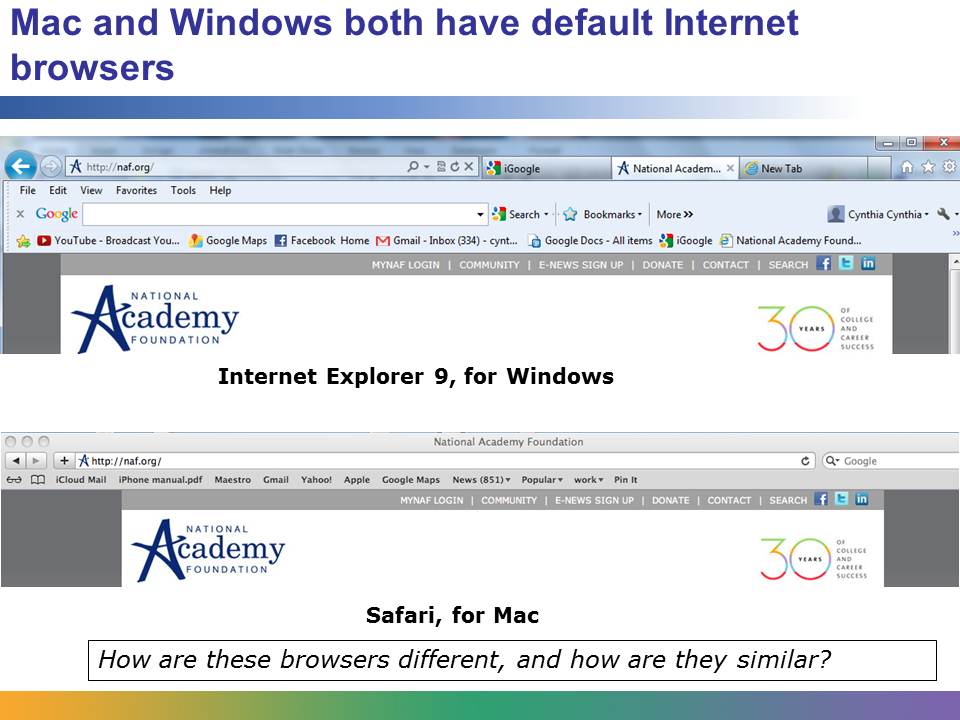


Macs and Windows PCs are different but are functionally very similar. One example is the difference between Windows and Mac mice. All Windows mice have at least two buttons, while some Mac mice have only one. Right-clicking and left-clicking fulfill the same functions in each machine. On a Mac with only one button, clicking is equivalent to the left button, while holding the Control key and clicking is equivalent to the right mouse button.

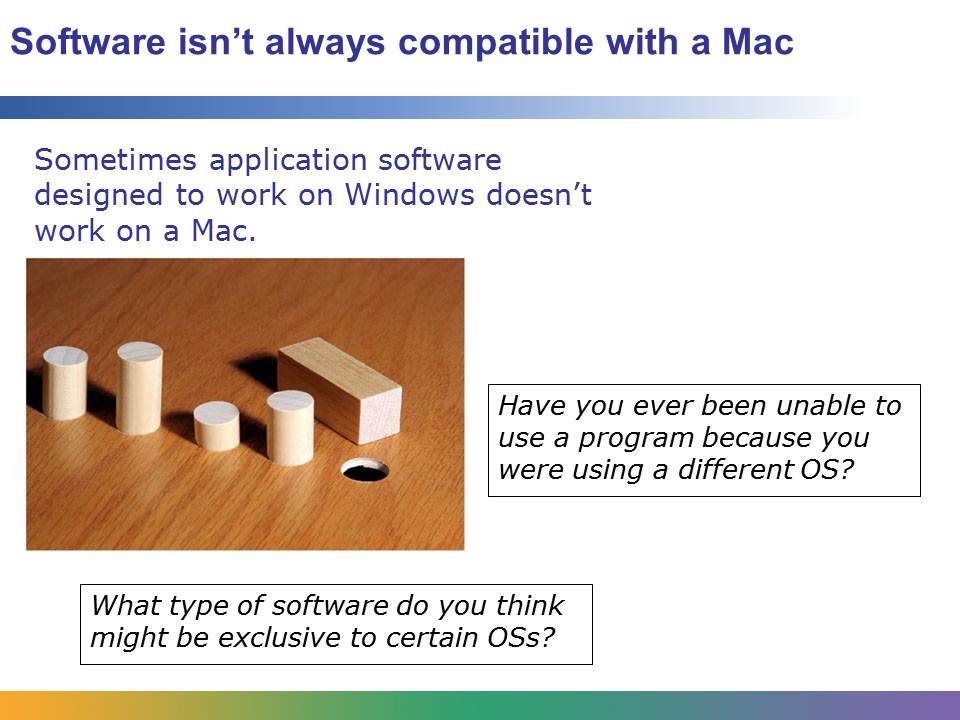
Mac mouse image courtesy of Wikipedia.



Mac uses the Dock to access system preferences as well as frequently used programs. The Dock is similar to the Windows Start menu. To open programs that are not on the Dock, you use the Finder, which is the Mac equivalent of Windows Explorer.



Different web browsers come pre-installed with different operating systems. Safari is the default browser for Mac, while Internet Explorer is the default for Windows. You aren’t limited to the one browser. There are many third-party browsers that work for both machines, and there is even a version of Safari for Windows. Although they are different programs, these browsers serve the same purpose and have very similar sets of features.

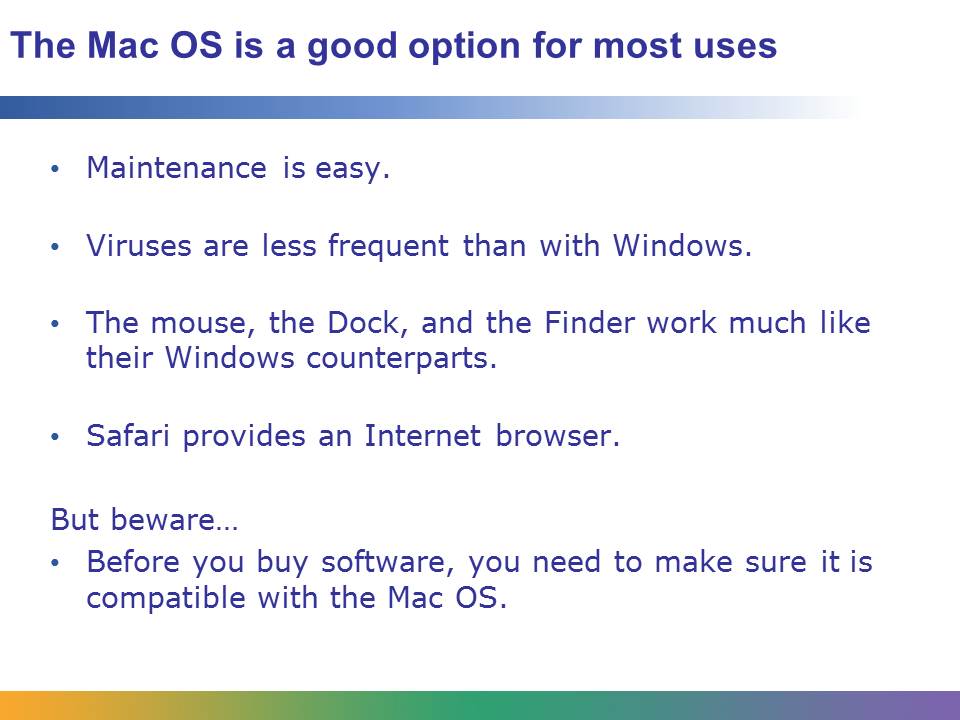


One of the biggest differences between Mac and other OSs is software compatibility. Differences in the way Mac and Windows are set up mean that for a piece of software to run on both systems, it would need multiple versions of code. Not all companies are willing to develop both versions, so some software is exclusive to a certain OS. Recently however, Apple Inc. has made it more convenient to run Windows on Mac machines, which allows Mac computers to run Windows software.

Although programs designed only for Windows can’t run on Macs, there are usually similar programs for Macs that can fulfill the same purpose. For example, 3D Studio Max, an animation program, will run only on Windows. However, Mac users can still produce 3-D animation using the program Maya.

When choosing between Mac, Windows, and Linux, it is important to keep in mind what you want to do with your computer. If you intend to make art, music, multimedia, or graphics, maybe a Mac is a good choice. If you’re a business user concerned about the books and basic file capabilities, you might prefer Windows. If cost is your main concern, maybe Linux is the best choice for you.

All in all, the Macintosh computer and associated operating system has provided a consistent, stable environment for personal computing since 1984, and it still seems to be going strong.



If you have an opportunity to use or to buy a Mac computer, chances are you will adapt to it really easily and like the way it works. If you are in a school or work situation where you need to use a Mac, remember that you can transfer the skills you have learned using Windows and quickly learn how to use a Mac.

Student Resource 8.3

Worksheet: OS Characteristics Comparison Chart

Student Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Directions: As you learn more about Mac and Linux operating systems, fill in the characteristics of each on this chart. At the end of this lesson, you will use your chart to create a poster describing the features of each OS.

|  |  |  |  |
| --- | --- | --- | --- |
| Characteristic | Windows | Linux | Mac OS |
| First introduced | 1985 |  |  |
| Installed base: Percent of computers in the world using this operating system | Claims 90% |  |  |
| Most common system maintenance utilities | Disk Defragmenter  System Cleanup  Check Disk |  |  |
| Plug-and-play peripherals? | Yes |  |  |
| User groups and different levels of permissions available? | Yes |  |  |
| Types of users attracted to this OS | Businesspeople, home users |  |  |
| Resistance to malware? | Highly vulnerable to malware, but with Windows Security Essentials and auto installing updates, the problem of malware can be managed effectively. |  |  |
| Where can users get support for this OS? | All sorts of classes, user groups, [http://www.microsoft.com](http://www.microsoft.com/) |  |  |

Student Resource 8.4

Reading: Similarities among Operating Systems

According to the Citizen’s Compendium, an online encyclopedia, there are 15 different types of operating systems in the world today. They were built for various reasons—to invent better systems for different uses, to make money, or as a programmer hobby. The three most popular desktop operating systems are Windows, Mac, and Linux.

In this reading, we’ll be examining the similarities of Windows, Mac, and Linux operating systems. Linux is based on an older operating system known as Unix. The first Linux systems had only a command-line interface (CLI) similar to the Unix CLI. Now, however, most Unix-based systems have added a graphical user interface (GUI).

Edubuntu is a modified version of Linux that has a GUI added to the Linux kernel. For this course, we will be using Edubuntu, because the GUI enables us to “see” what Linux can do. It operates very much like Windows and Mac. As a matter of fact, Windows, Mac, and Linux with Edubuntu have very similar appearances and accomplish things in much the same way.

Graphical User Interface

Each of the three operating systems offers a graphical user interface, or GUI. After the system boots up, you see a desktop on top of which you find graphics representing folders and application-launching icons. There are toolbars both at the top and bottom of each screen that offer similar features, including a clock, certain shortcuts, views of files open on your computer, and even some common information about your system (for example, whether your sound is set on or off).

You launch applications and files and folders in all the systems by either single- or double-clicking the graphical icons or menus.

Navigation

You can navigate each of these three operating systems using similar concepts. For example, folders hold files and mouse clicks cause something to open. In all of the systems, you can open frame areas (or windows—not to be confused with the Windows operating system) to show the contents or characteristics of a certain file or application.

There are also technical similarities in Windows, Mac, and Linux navigation.

Basic Computer Requirements

Recent versions of all three operating systems have the following minimum system size requirements:

|  |  |  |  |
| --- | --- | --- | --- |
| Windows 7 | Windows XP Professional | Mac OS X 10.6 (Snow Leopard) | Edubuntu (Linux)–Desktop Installation |
| 1GB of RAM | 64MB of RAM (128MB strongly recommended) | 2GB of RAM | 384MB RAM |
| 16GB of hard drive space | 1.5GB of hard drive space | 10GB of hard drive space | 3GB of hard drive space |

As you can see, system requirements do vary. All require a fair amount of RAM and disk space. Edubuntu has larger disk size and memory requirement than some other versions of Linux because of all the applications that are packaged in the Edubuntu version. A version of Linux that does not use a GUI, such as SUSE, uses a fraction of the disk and memory that Edubuntu uses.

All operating systems require certain types of microprocessors to run. The classic Mac operating system (replaced in 2002) ran only on Motorola processors, but Mac’s most recent OS incarnation (Mac OS X) now runs on Intel processors, as do both Windows and Edubuntu (Linux). Windows and Edubuntu (Linux) will also run on AMD processors, but Mac does not. In other words, you can’t assume that a particular operating system will run on all types of processors.

System Security

Although most malware is written to attack Windows systems (most likely because of its popularity), it is still a good idea to purchase special security software for the other operating systems. There are also certain security mechanisms and encryption systems in place in all three operating systems, including integrated firewalls and encrypted file systems.

The Kernel

The *kernel* is the central module of Windows, Mac, and Linux—in fact, of almost all operating systems. The kernel is a piece of OS code that loads first and remains in main memory. Because it stays in memory, it is important for the kernel to be as small as possible while still providing all the essential services required by other parts of the operating system and applications.

The kernel’s primary purpose is to manage the computer’s resources and allow other programs to use these resources. Typically, the kernel controls access to the following resources:

* The processor
* The computer’s memory (which is used to store both program instructions and data)
* Any input/output device, such as a keyboard, mouse, disk drive, printer, monitor, and so on

Phases of Operation

The Windows, Mac, and Linux operating systems, like most operating systems in use today, offer three phases of operation: booting up, up and running, and closing down.

The *booting up* phase involves the period during which the machine hardware is testing its own components before it is ready to execute software. Hardware testing occurs during POST, which is controlled by the startup BIOS, not the OS. During the boot-up process, the OS loads hardware drivers and all the files needed to run the OS. Users experience this as the boring period between when you turn on the computer and when the operating system is ready to respond.

When the power goes on, the computer’s basic input/output system (BIOS) is started. BIOS performs the following steps before the operating system loads:

1. It checks a database to see what hardware is installed.
2. It runs a diagnostic on the hardware to make sure the hardware is in good shape.
3. It locates a disk drive that has a “bootable” partition on it. It usually will start looking for a bootable floppy disk (if installed), then a CD, and then the hard drive. This is the process that lets you boot from an external disk if the operating system on your hard drive is not working.
4. It loads a special program (the bootstrap loader) from the chosen disk or partition.
5. The bootstrap loader program begins to load the operating system.
6. Once enough of the operating system is in memory (if no critical problems were found), the booting up phase ends, and the up and running phase begins.

In the *up and running* phase, the operating system software is ready to respond to user input and allow programs to run.

In the *closing down* phase, the computer stops responding to user commands and attempts a graceful shutdown of any running software and hardware.

Conclusion

All in all, the recent versions of Windows, Mac, and Edubuntu (Linux) are very similar. Therefore, if you are familiar with Windows and find yourself approaching an unknown operating system, keep in mind it probably won’t be all that hard to find what you’re looking for. Remember that Google is also your friend when you need to figure out how something works on an operating system that's new to you.

Student Resource 8.5

Reading: The Linux OS

Linux History

Linux was first publicly released in 1992 by a 22-year-old Finnish programmer named Linus Torvalds. When he started the project in 1991, he intended it to be a hobby, certainly not a big business. He first offered it for free to early computer enthusiasts who had 386/486 AT clones. (These computers were the same type of computers that ran Windows back then. Linux now runs on a variety of hardware platforms, from huge mainframes to desktop PCs to cell phones.)

Linux is available both as free software and open source software—that is, you can download and run it on your computer at no cost (free), and you can make changes to the code and redistribute it, usually for free.

More than 80 different versions of the Linux operating system exist today. Each includes support for different hardware devices and systems or software package configurations. Most are free, but some do charge licensing fees like Windows and Mac operating systems do. The Linux-based operating system we’re discussing in this lesson is the Edubuntu program, which runs on top of the Linux kernel and offers a graphical user interface (GUI).

Linux Functions

According to Linux.org, Linux enables you to do 95% of the tasks you can do with Windows on your home computer and 100% of your business computing. The software that runs on Windows or a Mac will not work with Linux and vice versa, but Linux does have a wide variety of applications and drivers specially written for it, and most are free. The operating systems can usually share output files—just not the applications themselves.

Linux Features

Linux offers a heavy-duty command-line interface (CLI), which really just means you type in instructions instead of clicking graphics to make things happen. But Linux is also used to build other graphical user interfaces such as Edubuntu, which is the one we’re studying in this lesson.

Because it has a heavy-duty CLI, Linux is a highly customizable operating system. Even though most Linux programs now come with a nice GUI to help you configure your computer, you can even go one step deeper and hand-edit the human-readable text files that control a user’s configuration.

Because Linux runs more smoothly than Windows, few (if any) system maintenance tools are available in operating systems that run on top of the Linux kernel. But to repair your Edubuntu system, you can find a “Rescue a Broken System” option at boot-up, which contains all the tools you might need for fixing your system when something goes wrong.

As far as data security in Linux goes, everyone who uses a Linux system has his or her own user name and password. Every file that exists on the computer belongs to both a user and a group.

A file folder can then have permissions (read, write, execute) assigned to a particular user and particular groups. For example, an individual user assigned to the file may be able to read and write to it, while a group assigned to the file might have only read access. Everyone else on the computer might not even be able to read the file.

Like Windows, Linux has a system administrator user account type—but in Linux it’s called *root* instead of *administrator*. This special user account has the right to do anything on the computer and therefore is not usually used unless a person has to do system maintenance. In Windows, the first person who logs onto a computer is automatically assigned the system administrator user type, which leaves a lot of people in Windows unknowingly using a root account—which can cause a lot of problems from both accidents and purposeful attacks. In Linux, this root account is much better defined and protected.

Regarding support, because Linux is a free operating system and a matter of much technical pride, there are a lot of places where you can find techies to give you free advice about using it. Take a look at [www.linux.org](http://www.linux.org) or [www.edubuntu.org](http://www.edubuntu.org) for user groups from across the world, free online classes that promise to teach you to use Linux in 20 lessons, and free applications.

There are a few commercial applications for Linux devoted to protecting Linux servers and desktops from malware, but because the Linux OS is estimated to be used on only 1% of the desktops in the world in 2007, it is much less likely that malware hackers will find the thrill and monetary rewards they do when attacking Windows computers, which make up 90% of the computers in the world. There are, however, 13 known and unpatched vulnerabilities in Linux, so it is certainly possible for the system to be hacked. According to Sucunia, a Danish company that specializes in “vulnerability intelligence” (<http://secunia.com/product/22/?task=advisories>), Windows XP has 30 known vulnerabilities.

Since Linux has been used to produce so many associated operating systems, when you add hardware peripherals to your system, it’s entirely possible that the driver your hardware needs will not automatically come with the operating system. However, Edubuntu comes with a huge library of pre-installed drivers, which means you can usually “plug” but will have to reboot your system before your hardware will “play.”

Student Resource 8.6

Worksheet: Basic Edubuntu (Linux) OS Functions

Student Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Directions: From the Linux File Browser screen, go to these tools, and mark the options you have with each one. Also, select one tool and describe, in your own words, what it does and what Windows function it mimics.

|  |  |  |
| --- | --- | --- |
| File Browser Functions | What Options Do You See? | What Does the Tool Do? |
| File |  |  |
| Edit |  |  |
| View |  |  |
| Go |  |  |
| Bookmarks |  |  |

Student Resource 8.7

Poster Assignment: Operating System Features

Directions: Imagine that you must explain the benefits of Windows, Mac OS, and Edubuntu (Linux) to someone who knows what an OS is but has never used any of these operating systems. It’s your job to help this person decide which OS is best for their personal use.

Work with your group to create a poster or other visual representation that explains the advantages and disadvantages of each OS. Choose one feature of each operating system that you think best represents each OS, such as the GUI, the system utilities, or security features. Base your poster on the information you’ve gathered from your reading and your experiences in class.

Your poster should include the following:

* An illustration or description of one feature of each operating system
* An explanation of why it’s important
* A brief summary of how that feature is used

You can go to these websites for screenshots and graphics that you can print or draw to use for your poster:

* <http://www.edubuntu.org/Screenshots>
* <http://www.apple.com/macosx/features>
* <http://www.microsoft.com/presspass/press/2004/aug04/0806WinXPSP2Images.mspx>

Check to make sure your assignment meets or exceeds the following assessment criteria:

* Visual representations clearly illustrate features of each operating system.
* The poster provides a clear explanation of why each feature is advantageous.
* The poster explains how the features are used.
* The poster would make sense to someone who has never used these operating systems.
* The poster is neat and uses proper spelling and grammar.